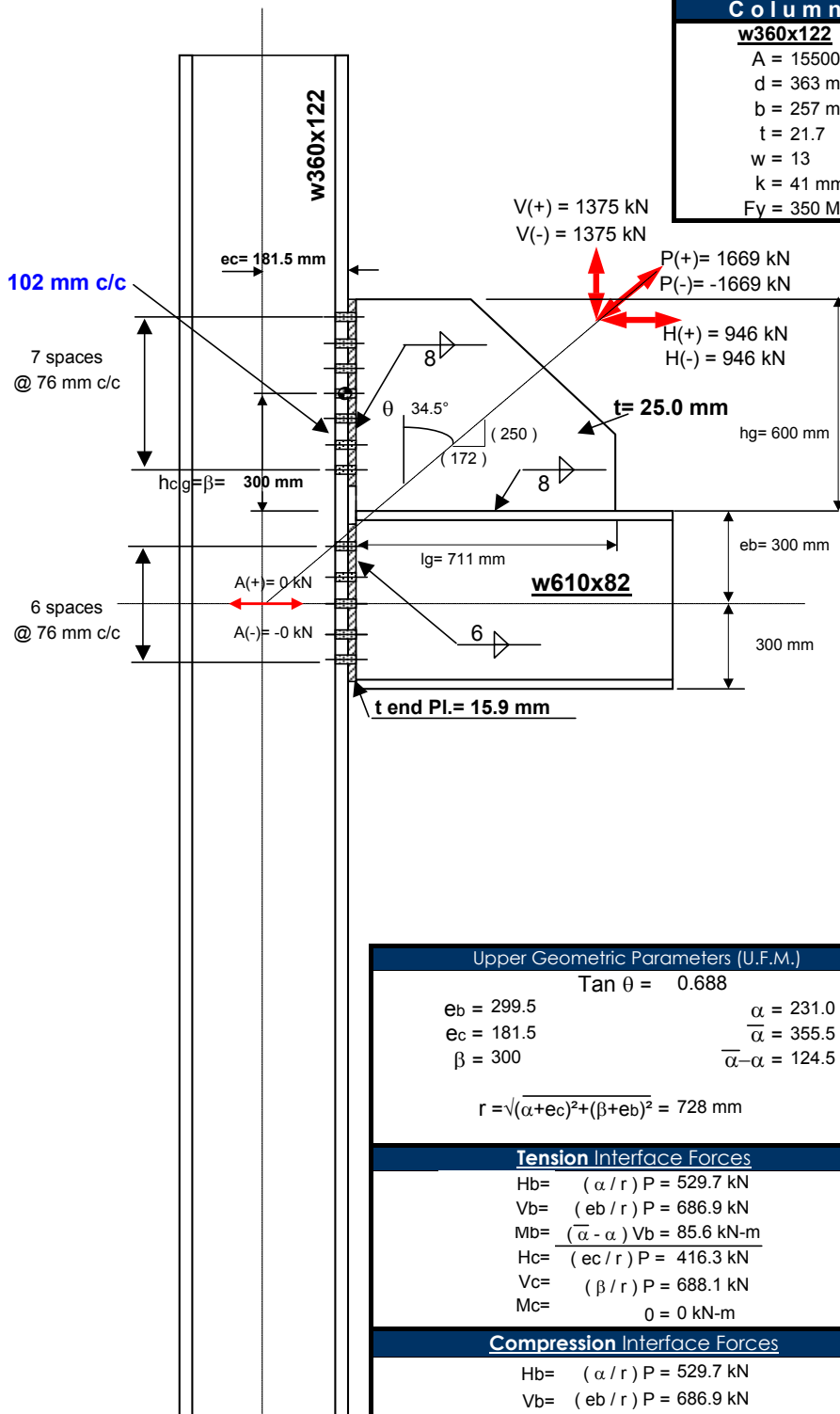


Material	
Column	Section: w360x122 Fyc: 350 MPa
Beam	Section: w610x82 Fyb: 350 MPa
Gusset	Fyg: 300 MPa
End Pl.	Fyp: 300 MPa
Geometry	
Lx:	172 mm (172)
Ly:	250 mm (250)
h c.g. = $\beta = \beta^-$:	300 mm
hauteur gousset: hg:	600 mm
Longueur gousset: Lg:	711 mm
Axis Location	
Exc.	d/2 300 mm
Brace Force	
Upper Brace Forces	
Tf = P(+)	= 1669 kN
Cf = P(-)	= 1669 kN
Beam Shear	
	247.0 kN (247.0 kN)
Pass Thru Force	
T.F.(+) = A(+)	= 0 kN
T.F.(-) = A(-)	= 0 kN
ΔV_b (Interface Col.-Gusset)	
ΔV_b (0% or 100%)	= 0 %

BOLT	
Type	A325
Class	A
Diam.	25 mm
Bolt fillet	incl
Vr:	118 kN
Vs:	60 kN
Tr:	210 kN
Abolt:	507 mm ²
Fu bolt:	825 MPa

Beam	
w610x82	
A	= 10400 mm ²
d	= 599 mm
b	= 178 mm
t	= 12.8
w	= 10
k	= 32 mm
Fy	= 350 MPa
Column	
w360x122	
A	= 15500 mm ²
d	= 363 mm
b	= 257 mm
t	= 21.7
w	= 13
k	= 41 mm
Fy	= 350 MPa

N.B.: The user is responsible of the accuracy of the results



Upper Geometric Parameters (U.F.M.)		
Tan $\theta = 0.688$		
$e_b = 299.5$	$\alpha = 231.0$	
$e_c = 181.5$	$\bar{\alpha} = 355.5$	
$\beta = 300$	$\bar{\alpha} - \alpha = 124.5$	
$r = \sqrt{(\alpha + e_c)^2 + (\beta + e_b)^2} = 728 \text{ mm}$		
Tension Interface Forces		
Hb =	$(\alpha / r) P = 529.7 \text{ kN}$	
Vb =	$(e_b / r) P = 686.9 \text{ kN}$	
Mb =	$(\bar{\alpha} - \alpha) V_b = 85.6 \text{ kN-m}$	
Hc =	$(e_c / r) P = 416.3 \text{ kN}$	
Vc =	$(\beta / r) P = 688.1 \text{ kN}$	
Mc =	0 = 0 kN-m	
Compression Interface Forces		
Hb =	$(\alpha / r) P = 529.7 \text{ kN}$	
Vb =	$(e_b / r) P = 686.9 \text{ kN}$	
Mb =	$(\bar{\alpha} - \alpha) V_b = 85.6 \text{ kN-m}$	
Hc =	$(e_c / r) P = 416.3 \text{ kN}$	
Vc =	$(\beta / r) P = 688.1 \text{ kN}$	
Mc =	0 = 0 kN-m	

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Upper Gusset-Beam Interface

Force on gusset	Weld Design	Gusset Interface Design	Beam Web Verification
Pf(+)= 1669.0 kN Pf(-)= 1669.0 kN	Lweld= 1422 mm S weld= 168507 mm ²	L = 711 mm t = 25 mm Ag = 17775 mm ² Sxg = 2106338 mm ³	L = 711 mm t web = 10 t Dbl PL= 0 mm Aweb= 7110 mm ² Sweb= 842535 mm ³
Gusset Beam Interface Hb= 529.7 kN Vb= 686.9 kN Mb= 85.6 kN-m	qf Vb = 0.483 kN/mm qf Hb = 0.373 kN/mm qf Mb = 0.508 kN/mm qf peak = 1.058 kN/mm 1.4 qf mean. = 1.156 kN/mm D res. >= 7.6 mm D = 8.0 mm	$\tau = 29.8$ <157 o.k. $\sigma = 79.3$ <270 o.k. $\sigma_{cr} = 94.6$ <270 o.k.	$\tau = 0.0$ <183 o.k. $\sigma = 198.2$ <315 o.k. $\sigma_{cr} = 198.2$ <315 o.k.

Flg Capacity= 718 kN

Gusset Design (Whitmore)	
Lw= 700 mm L = 0 mm Aw= 17500 mm ²	L(avg.)= 0 mm r= 7.22 mm K= 0.5 KL/r= 0.0 $\lambda = 0.00$
Tr=4725 kN Cr= 4725 kN	> 1669 kN o.k. > 1669 kN o.k.

Upper Gusset-Column Interface

Gusset-Column Interface Forces	Flg capacity: 1757 kN	Gusset Weld Design
Hc= 416.3 kN Vc= 688.1 kN C.F.= 1.5	Vc web = 0 kN Hc= 416.3 kN w360x122	Vc = 688.1 kN Hc = 416.3 kN Lw = 1228 mm qv = 0.56 kN/mm qb = 0.34 kN/mm qr = 0.65 kN/mm D >= 4.3 mm D= 8.0 mm
Bolt group characteristics nbr of bolts= 16 I x-x = 485184 Ab mm ² S x-x = 1824 Ab mm Long. tot. = 532 mm y(c.g.) top.,bot. = 266 mm		Gusset Vc = 688.1 kN Hc = 416.3 kN L = 614 mm t = 25 Ag = 15350 mm ² $\tau = 44.8$ <157 o.k. $\sigma = 27.1$ <270 o.k. $\sigma_{cr} = 82.2$ <270 o.k.
Bolt Direct Factored Force Tf=26.0 kN/bolt Vf=43.0 kN/bolt	END PLATE GEOMETRY Length= 614 mm t= 25 mm Z sup.= 32 mm Z inf.= 50 mm g = 102 mm e = 38 mm Larg. = 178 mm Fy = 300	Column Web Vc = 0.0 kN Hc = 416.3 kN L = 614 mm t = 13 Ag = 7982 mm ² $\tau = 0.0$ <183 o.k. $\sigma = 52.2$ <315 o.k. $\sigma_{cr} = 52.2$ <315 o.k.
Column Web Bearing Resistance Bf= 43.0 kN/Bolt Br= 122.5 kN/Bolt o.k.		End Plate Shear Resistance 2004 kN o.k.
	p = 70 mm K = 5.50 $\delta = 0.61$ t max.= 12.0 mm t min.= 9.4 mm t end Pl.= 12.7 mm $\alpha = 0.00$	Maximum Bolt Factored Force Tf= 26.0 kN / bolt Vf= 43.0 kN / bolt Ultimate Resistance Verification Vf / Vr = 0.36 o.k. Tf / Tr = 0.12 o.k. (Vf / Vr) ² + (Tf / Tr) ² = 0.15 o.k.
End Plate Column Flange t= 13.0 mm b'=32.0 mm b= 44.5 mm a'= 50.5 mm a= 38.0 mm g= 102 mm L calc.= 178 mm L col.= 257 mm	p = 76 mm K = 5.35 $\delta = 0.64$ t max.= 11.8 mm t min.= 9.2 mm t Col. fl.= 21.7 mm $\alpha = 0.00$	Maximum Bolt Service Force T = 17.3 kN / bolt V = 28.7 kN / bolt Slip Resistance interaction (V/Vs)+1.9 (T/(Ab Fu)) = 0.56 o.k.

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BEAM-Column Interface

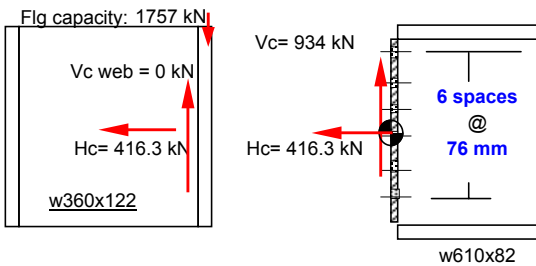
Gusset-Column Interface Forces
Hb= 416.3 kN Vb= 933.9 kN C.F.= 1.5

Bolt group characteristics
nbr of bolts= 14 $I_{x-x} = 323456 \text{ Ab mm}^2$ $S_{x-x} = 1419 \text{ Ab mm}$ Long. tot. = 456 mm y(c.g.) top.,bot. = 228 mm

Bolt Direct Factored Force
Tf=29.7 kN/bolt Vf=66.7 kN/bolt

Column WEB Bearing Resistance
Bf= 66.7 kN/Bolt Br= 153.4 kN/Bolt o.k.

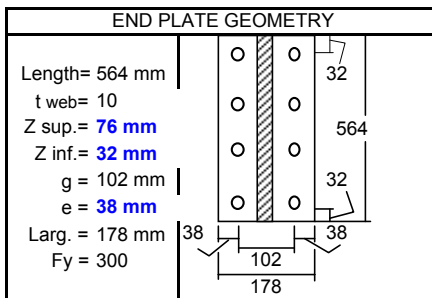
End Plate Shear Resistance
2371 kN o.k.



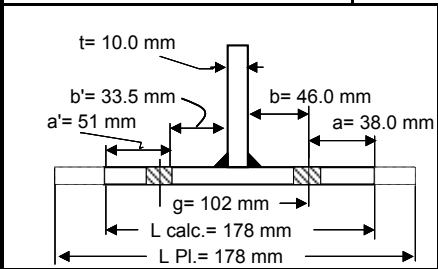
Beam End Plate Weld
Vc = 933.9 kN Hc = 416.3 kN Lw = 1128 mm qv = 0.83 kN/mm qb = 0.37 kN/mm qr = 0.91 kN/mm

D >= 6.0 mm
D= 6.0 mm

Beam Web
Vc = 933.9 kN Hc = 416.3 kN L = 564 mm t = 10 t Dbl PL > 14.8233 t Dbl PL = 0 Ag = 5640 mm ² $\tau = 165.6 < 183 \text{ o.k.}$ $\sigma = 73.8 < 315 \text{ o.k.}$ $\sigma_{cr} = 296.2 < 315 \text{ o.k.}$



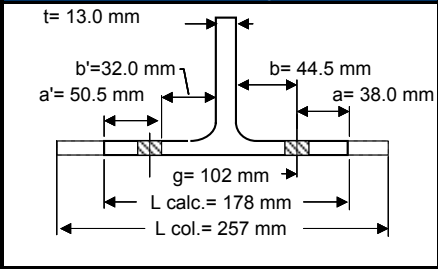
Column Web
Vc = 0.0 kN Hc = 416.3 kN L = 564 mm t = 13 t Dbl PL > 8.26214 t Dbl PL = 0 Ag = 7332 mm ² $\tau = 0.0 < 183 \text{ o.k.}$ $\sigma = 56.8 < 315 \text{ o.k.}$ $\sigma_{cr} = 56.8 < 315 \text{ o.k.}$



p = 70 mm K = 7.09 $\delta = 0.61$ t max.= 14.5 mm t min.= 11.4 mm t end Pl.= 15.9 mm * 0.00

End Plate Column Flange

Tf (in bolt)= 29.7 kN / bolt Tf (in bolt)= 29.7 kN / bolt
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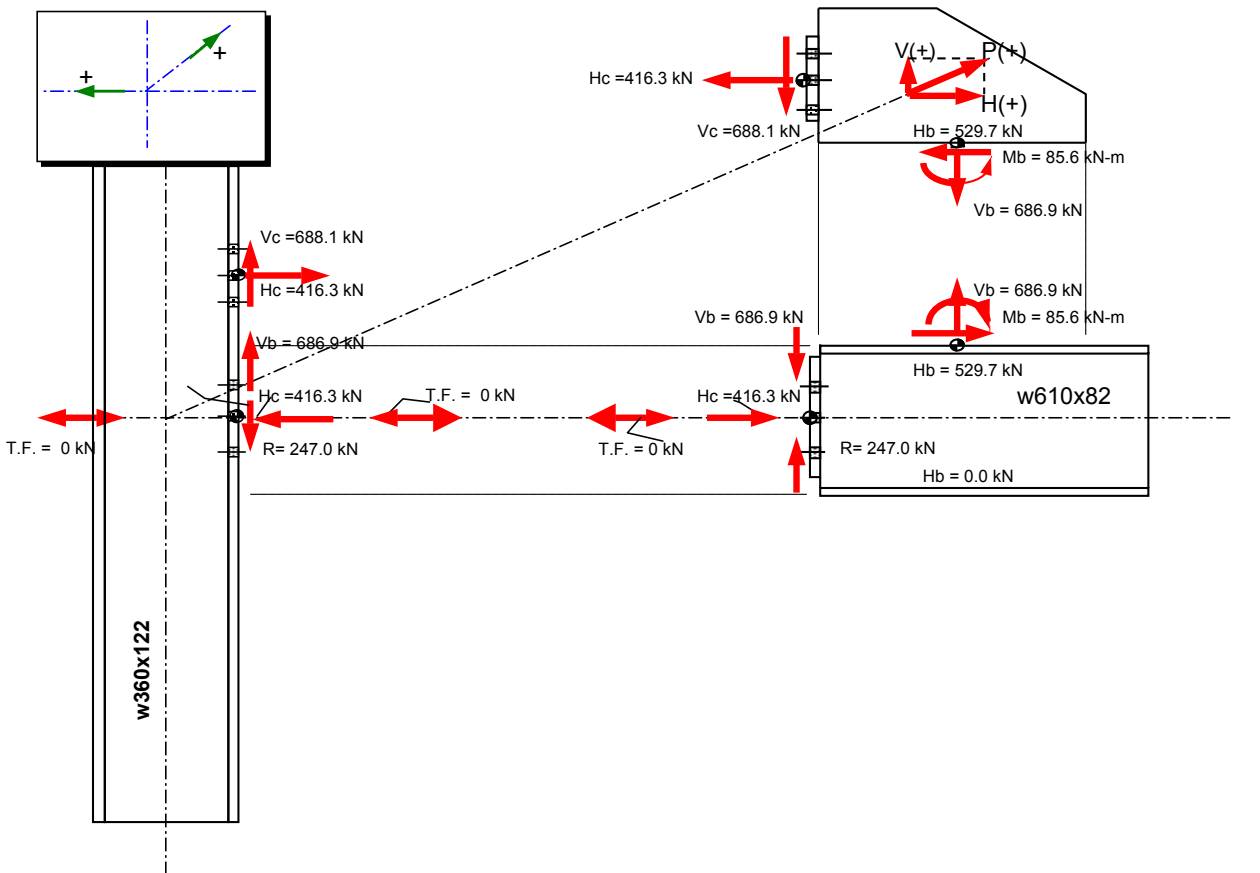
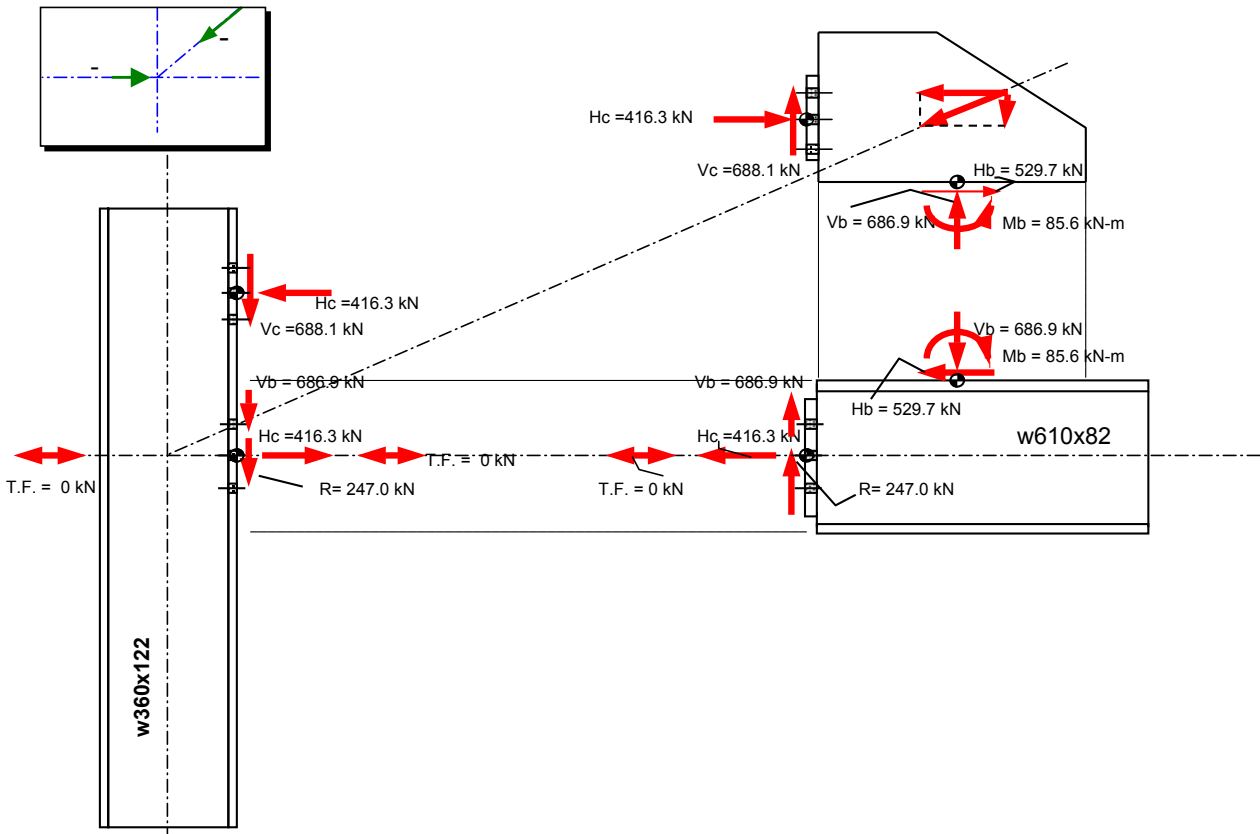


p = 76 mm K = 5.35 $\delta = 0.64$ t max.= 12.6 mm t min.= 9.8 mm t Col. fl.= 21.7 mm $\alpha = 0.00$

Maximum Bolt Factored Force
Tf= 29.7 kN / bolt Vf= 66.7 kN / bolt Ultimate Resistance Verification $V_f / V_r = 0.57 \text{ o.k.}$ $T_f / T_r = 0.14 \text{ o.k.}$ $(V_f / V_r)^2 + (T_f / T_r)^2 = 0.34 \text{ o.k.}$

Maximum Bolt Service Force
T= 19.8 kN / bolt V= 44.5 kN / bolt Slip Resistance interaction $(V/V_s) + 1.9 (T / (Ab Fu)) = 0.83 \text{ o.k.}$

Vertical Heavy Bracing Connection (Uniform Force Method)



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